Kevin L. Jones

# Ecological Approaches to the Stabilization of Civil War Earthworks

*The following article is abstracted from* Archaeological Site Stabilisation and Reconstruction in the United States *by Kevin Jones. The full report is a significant and comprehensive guide to site stabilization. It presents the results of 1993 field visits to more than 25 separate earthworks locales in nine states to examine sites from the Paleo-Indian period through the Civil War. Study objectives included methods for recording and assessing damage, vegetation management, and physical techniques for protection. Mr. Jones' work was supported through a Winston Churchill Memorial Fellowship. The Fellowship recognized the nationally-important need to preserve and protect earthworks associated with Maori history and culture, as well as the practical significance of international information exchange.*

The protection of archaeological sites and earthworks, such as Civil War fortifications, has lagged behind other fields of historic conservation. For example, buildings are rigorously protected from weathering effects. Conservation treatments take the historic objects out of the natural ecological processes that might otherwise affect them. By contrast, archaeological sites, being part of the soil, are fundamentally affected by ecological processes: soil formation and erosion, weathering, siltation, tree root growth, and burrowing and grazing animals.

Attention is now being devoted to ecologically appropriate ways in which sites can be maintained in their natural setting but in such a way as to ensure conservation. Sites need protection and management of (a) *surface features*, such as the profiles of mounds or ditches, which can be subject to soil erosion, or damaged by stock, so that they continue to be places of interest, where the public can see the evidence of past human activity; and (b) *sub-surface deposits* which are subject to natural or induced deleterious effects. An example of an induced effect is deliberate burial which changes the chemical processes and physical pressures on a site.

It has long been recognised that grasses are the best cover for archaeological sites. However, grasslands are readily invaded by shrubs and eventually trees unless they are grazed, mowed, burnt, or naturally subject to extremes of drought or cold. In the eastern United States, forest or shrubland is the natural vegetation cover and open grassed sites soon succeed to forest. This ecological process occurs on archaeological sites once they are abandoned by human beings. The problem for the modern land manager is to decide what to do with the forest succession on the site: should there be concern about root intrusion into the site's stratigraphy? What about the mitigating effects of forest against rain and soil erosion? Is it warranted to clear the understorey to maintain views? If so, how can the long-term maintenance of the forest cover be ensured?

In the mid-1980s concern grew in the United States National Park Service about the conservative capacity of the existing ground and forest covers on Civil War sites. Of the large areas of battlefield that came to the Union War Department after 1865, only a small proportion was maintained in its original farmed or grassland cover. Small areas were treated as memorial landscape and kept in grass to reflect the setting of key actions known to have taken place on open ground—Gettysburg being the most notable example.

In most areas, however, trees were generally allowed and there was no intervention to manage succession. (In some areas, trees would be historically correct for example, at the Wilderness battle site.) At about 60-80 years of age the initial

*Cold Harbor, Richmond National Battlefield Park. Confederate trenches under open oak/hickory forest.The forest floor here has been cleared of shrubs; the soil is acid and infertile; only mosses and thin grass grow with some oak seedlings in foreground.How will the protective forest canopy last in the long term unless such seedlings are selectively allowed to grow? Photo by the author.*

colonising pine trees start to lose their vigor and begin to die. These trees eventually fall. They are replaced by hard woods such as oaks and hickories which eventually take over as site cover. After about 100 years well established oak-hickory forest covers the archaeological site.

### *The Andropogon Reports on Earthwork Management*

In 1987-88, the National Park Service Mid-Atlantic Regional Office engaged the services of Andropogon Associates to consider the ecological management of Civil War sites to protect the values espoused in parks' operating philosophies. The main conclusions of the Associates' report, *Earthworks Landscape Management Manual*, were (a) there should be much less use of wide areas of closely mown grasslands; (b) greater use should be made of tall or medium height native grass swards on earthworks, sufficient to protect and at the same time expose the earthworks for view; and (c) attempts should be made to establish a more natural forest ecology on those sites where visibility was sought and forest was left to grow.

*Successful establishment of little bluestem on Battery 5, Petersburg National Battlefield Park. The invasive shrubs (e.g., sweet gum at left) may be removed by burning or hand-weeding. The age of establishment is approximately 2 years and the grass now offers good protection. The figure is John Davis, park interpreter. Photo by the author.*

A more natural forest ecology regime allowed for visibility of the site, without severe removal of the ground-cover, while allowing some (but not natural densities of) understorey trees and saplings to grow so that they would eventually replace the canopy species in the forest as the latter died. At the same time, grasslands would be restored or re-constructed. In short, a suitable archaeological cover could be devised using insights from savannah restoration now widely practised in the United States. (The analogy cannot be taken too far, however, because southern soils are often leached and of poor fertility, particularly those thrown up from the subsoil into defensive banks. Mid-Western savannah forms very rich soils.)

The establishment of native grassland on earthworks is being undertaken on a relatively small scale at both Richmond and Petersburg National Battlefields, Virginia, following the recommendations of Andropogon Associates.

### *Two Battlefield Case Studies in Virginia*

The Virginia battlefield parks were the main focus of the Andropogon Associates study and report. The **Richmond National Battlefield Park** commemorates Union campaigns against the Confederate forces under McClellan in 1862 and again under Grant in 1864. The battlefields of both Richmond and Petersburg (discussed below) are characterised by very extensive lines of trenches and forts, on a perimeter some 5-20 km from the city centres.

Cold Harbor was the scene of fighting in 1862 and 1864 over an 11 km-long front with only 150 acres today reserved in the park. The lines of the Confederate and Union armies in 1864 consist of more or less parallel lines of trench and breastwork, three and four ranks deep, taking advantage of low ridgelines. Toward the northern part of the unit, where the opposing lines are close together (and many thousands of Union soldiers were killed or injured), the surface has had all shrubs removed to reveal the form of the trenches. Soils are clayey and are of poor fertility. The near-ground plant cover is particularly thin, consisting of a few strands of grass and mosses, caused by the lack of light and fertility and high soil acidity. Happily, visitors follow the road and generally respect the signage asking them to stay off the earthworks.

In the adjacent area of the no-man's land between the lines, there had been an attempt, earlier this century, to open up the battlefield and to grass it with the object of presenting an historical vista. Today the forest cover here is almost entirely 50 to 60 year old pine (probably loblolly, *Pinus taeda*), with small, sparse seedlings of oak, hickory, and sassafras. The natural forest succession through pine to oak/hickory has been arrested when the grassland failed, and the pines were allowed to grow to full size by an earlier park management. The understorey has continued to be removed up to the present day with the result that there is no provision for eventual replacement of the pines which will become senescent in the next few decades. Their removal will be costly but could not have been avoided in any event unless a decision were made to allow a natural forest succession.

This pattern of open area under widely spaced pine surrounded by a natural succession of oak/hickory forest with an understorey is very distinct. A new interpretative track follows the lines through this oak-hickory forest, and may offer the chance to retire the northern, open, part to a more natural succession.

The park's historical land management has therefore set difficult ecological parameters with which to work, but overall the battlefield presentation is effective. It offers a clear sense of the murderous proximity of the opposing lines, and an effective treatment (for interpretation) of the trenches with drifts of Fall leaves piled against the banks.

*Fort Fisher, Petersburg.A young oak-hickory-holly forest cover on the earthworks.There are plentiful seedlings re-generating on the banks and a loblolly pine (*Pinus taeda*, a clue to the young forest age) at right. A high winter water table in the ditch (centre) kills off any plant growth. Photo by the author.*

Elsewhere, Fort Harrison is at the centre of a long (approximately 8 km) linear easement which protects Union and Confederate lines running north from Fort Brady on the James River. Parts of the fort and some of the adjacent linear earthworks have been grassed in little bluestem (*Andropogon scoparius*), a shorter prairie-grass species endemic to regions from the Appalachians to the eastern seaboard. The standing forest in the park unit is pines with an oak-hickory forest succession fairly well advanced. About 200 m of the earthworks near the picnic site, one kilometre from Fort Harrison, were planted with *A. scoparius* plugs (nursery grown planter-pots of the species) about 3 years ago. The technique was to kill pre-existing vegetation with a herbicide, to clear any shading forest within approximately 10 m of the earthwork, and to plant in the plugs in autumn at a density of greater than 1 at l' centres (i.e., a density of about 6 plugs/$m^2$). The grass growth has been hand-weeded, but not in the last year. The weeds requiring special attention were honeysuckle, blackberry, and broadleaf weeds generally.

Fort Harrison itself has been treated in a similar fashion in some parts. The earlier treatments (1989-1990?) covered larger traverse earthworks in the centre of the fortification. The traverses have not been weeded since establishment, because they are isolated in the grassed centre of the fort and it is anticipated that they can be fired as a unit to clear the shrubland which is rapidly establishing. At the time of visit, this shrubland consisted of 1-2 m-high saplings of pine, oak, hickory, and sweet gum; among the short-lived weeds were goldenrod (*Solidago* sp.), pokeweed (*Phytolacca* sp.), and daisy fleabane (*Erigeron* sp.); and the vines include the native grapevine (*Vitis* sp.), blackberry and raspberry (*Rubus* sp.). Little bluestem (*A. scoparius*) was present in low densities throughout and had thrived on the southern aspects. In some places, the traverses appear to have originally been in exotic grasses which were not cleared, and here the *Andropogon* was not present.

In the summer of 1992-1993, an attempt was made to cover further areas of the perimeter earthworks of Fort Harrison. Here the herbicide Roundup was applied to an existing shrub cover, and the cover cleared from the ground surface. To protect the exposed soil, straw mulch was applied. Plugs of *A. scoparius* were planted at 30 cm intervals over some 50 m length of the earthworks (estimated to be 12 m wide, an area of about 600 $m^2$). Unfortunately, the exercise was undertaken in the notoriously dry, hot summer of 1993, due to the availability then of student conservation corps labor. At the time of my visit (late October 1993), most of the plugs had failed, except for a few still alive at the base of breastworks. A contributing factor to the apparent failure of this particular plot may have been the retention of some shade trees in the vicinity of the earthworks. The park also has no capacity to irrigate the newly-established grass.

The **Petersburg National Battlefield Park** commemorates the Union siege of 1864-1865, which followed the Union debacle at Cold Harbor where Ulysses S. Grant realised that he could not take Richmond directly.

Battery 5, a simple breastwork enclosure with embrasures (earthwork enclosures for gun emplacements), is close by the park visitor center and maintenance complex. It has been cleared of tree cover many times in the past, with the result that it has stood in a pine (probably loblolly, *Pinus taeda*) successional stage for much of the time. There had also been repeated attempts to lime the acid soils under the pine trees and to establish fescue K31. This had failed due to drought, acidity and shade; the effect here was probably not dissimilar to that described previously for the open parts of Cold Harbor in the Richmond National Battlefield. The main grass which established here was crab grass (*Digitaria sanguinalis*). There was extensive wear from visitor usage.

The recommended prescription from Andropogon Associates had been: (a) repair of eroded areas (by applying topsoil), (b) mulching and oversowing with fescue K31, a clover, and *A. scoparius*. I was advised that fescue K31 only had been sown, and not the native grasses, the latter being a quick adventive in all old fields in Virginia. However, I believe that the *A. scoparius* must have been sown or plugged to achieve the density that I saw. Although attempts have been made to correct fertility and acidity problems, *A. scoparius* has invaded naturally on the failure of the fescue and has competed successfully with the annuals. Vines (principally honeysuckle and blackberry), tree saplings (pine, probably *P. taeda*, oak, sweet gum *Liquidambar styraciflua*, wild cherry *Prunus* sp.) and sedges are establishing on the slopes of the

earthworks. The crab grass is still dominant in the central, flat, closely-mown part of the fortification.

The pattern of *A. scoparius* establishing naturally on an earthwork was evident at The Crater, one of the most famous sites of the Civil War. Fescue thrives on the cool, north-facing interior slopes and at the bottom. *Andropogon scoparius* forms a fairly even sward composed of small clumps on the south-facing slopes, and on low ridges on the north face. Here, it is naturally established. This seems to represent a natural microclimatic and edaphic (soil) preference of the plant, while it has difficulty competing with the fescue under well-watered and cooler conditions.

### *What is the Best System of Stabilisation?*

This question has no simple answer. Demonstrated successes on the eastern Civil War battlefield parks, converting unsatisfactory brush- and/or vine-weed covers to indigenous grasses, have been relatively small in scale, compared with overall park management requirements. They have required detailed prioritisation, forest clearance, close management and manipulation of soil acidity and fertility, herbicide applications, rehabilitation of profiles at topsoil level, and irrigation of newly established grasses. The cost-effectiveness of this procedure, compared with simply allowing conventional grass covers to grow longer with less fertiliser application, is still under review. The higher cost of initial establishment of native grass covers (neglecting potential damage to earthwork fabric) is established. However, it will be some years before the on-going costs of native grassland cover can be compared with conventional management.

In some places, unwarranted management practices, involving ground clearance over historic earthwork fabric and single- or few-species replacement programmes, were failing because of maladaptation of those species to annual seasonal variation in conditions. These ground covers surely fail completely in the longer term. Some park managers fail to recognise that naturally established, sometimes "weed" species (both natural and introduced), can usually provide a good conservative ground cover. Such natural ground covers (based on locally occurring natural ecological processes) need to be manipulated but cannot be prevented from developing of their own accord without great cost and, worse, great threat to historic fabric.

*Confederate Fort Gregg, Petersburg. Site of a recent conversion from pine oak-hickory forest to grassland. The site on clearance was top-dressed with topsoil and planted in the annual grass, winter rye (now dead). Later, the site was planted in perennial fescue varieties which will come through the adventive summer annual crab grass (prominent here).Little bluestem will come in as an adventive and compete well with the fescue on south-facing banks. Photo by the author.*

Fire can be used in the maintenance of native grasslands in the face of forest invasion. However, unless local fire authorities allow the practice as a routine in local agricultural management, it will have little place in historical parks. This is especially so in the urban or near-urban settings of the eastern seaboard. The pattern of park forest and grassland cover (and other facilities such as roads and buildings placement) will need to be carefully designed for fire. In addition, the cost of meeting park regulations concerning fire management is probably too great for the small park units devoted to national battlefield management.

There is no consensus on the desirability of allowing forest cover to develop on archaeological sites. On much-visited sites, tree clearance is carried out and grass established, but in many more cases understorey only is removed, or the forest and its understorey is left. In the east and south-east, a pine and subsequent oak-hickory succession is accepted on parts of extensive sites, except where close management is sought. In some parks, trees will not be replaced as they senesce (age). No solution has been found to the control of adventive vine weed-species, some of which had been introduced as a ground cover in previous attempts at establishing a conservative ground cover. In some parks, less noxious vine ground covers such as periwinkle are still encouraged where clearance of understorey species has been carried out.

Removal of understorey species over quite large areas is practised in most parks. Although this is the simple solution to maintaining visibility of site features, its effects on regeneration prospects for forest (where desired) are not always being recognised. The successful examples show that a form of slightly artificial savannah (mixed grassland and groves of regenerating forest, originally maintained by fire and buffalo grazing) can offer site protection and the visitor attraction of reconstructed prairie or native grasslands.

Trees are a mixed blessing in protecting against erosion: (a) trees are very heavy and, where sited at the head of a slopes, their developing weight poses the risk of slope failure; (b) when the trees die they leave cavities which can conduct water down into the sediments beneath, again a problem on slopes; (c) there is a risk of tree throw, particularly under severe windstorm conditions, or for certain genera such as *Robinia* (for example, black locust, an early successional component); (d) trees do not protect as much as believed from the splash of raindrops falling on the ground. In addition, there is always a time when the trees have to be felled, either because of old age or failure to

thrive or for harvest, and this process is particularly catastrophic from the point of view of erosion protection.

---

**Selected references**


Andropogon Associates. 1988. *Earthworks Landscape Management Action Plan for the Petersburg National Battlefield.* Prepared for National Park Service, Mid-Atlantic Regional Office.

Burrows, C.J. 1990. Changes in some temperate forests after disturbance. Ch. 9 (pp. 298-329) *in* C.J. Burrows *Processes of vegetation change*. London, Unwin Hyman.

Jones, K.L. 1994. *Archaeological Site Stabilisation in the United States; Winston Churchill Memorial Fellowship Report 1993.* (Science and Research Internal Report No. 145.) Wellington NZ, Dept of Conservation.

Kricher, J.C. 1988. *A Field Guide to Eastern Forests.* Boston, Houghton Mifflin.

Linenthal, E.T. 1991. *Sacred Ground: Americans and Their Battlefields.* Urbana and Chicago, University of Illinois Press.

Packard, S. 1988. Just a few oddball species: restoration and the rediscovery of the tallgrass savannah. *Restoration and Management Notes,* 6(1): 13-23.

Thorne, Robert M. 1990. Revegetation: the soft approach to archaeological site stabilization. [*Archaeological Assistance Program*] *Technical Brief 8.* (U.S. National Park Service.)


---


*Kevin Jones is an archeologist with the Science and Research Division of the New Zealand Department of Conservation. In 1993, he spent two months in the United States looking at archeological site stabilization.*


*He thanks David Orr, Richard Waldbauer, Frank McManamon, Paul Nickens, Robert Thorne, John Ehrenhard, Kent Schneider, Leslie Sauer, Cynthia McLeod, Mike Brennan, Michael Hill, and John Davis, and in New Zealand, Colin Burrows, Philip Simpson, and Aidan Challis, for their assistance. Copies of Mr. Jones' full report are available for $26 from the Science and Research Division, Department of Conservation, P.O. Box 10-420, Wellington, New Zealand.*



Candace Clifford


## *Cooperative Partnership Preserves Lighthouses*

A partnership of three federal agencies and a non-profit society is working to preserve American lighthouses. The National Park Service (NPS), U.S. Coast Guard (USCG), Department of Defense (DoD), and U.S. Lighthouse Society (USLHS) have joined forces on a multi-faceted project to initiate a comprehensive historic preservation program for the U.S. Coast Guard. This project includes a survey, a training course, condition assessments, and a handbook.

### *Survey*

The Coast Guard is responsible for buildings, sites, structures, and objects, including artifacts, documents, archeological sites, and properties of traditional cultural and religious significance to Native American communities. The survey will address all these property types, assess the current level of preservation planning for these resources, and recommend actions to improve Coast Guard historic and cultural resources management practices.

*Cove Point Light Station,near Lusby, MD.Tower constructed 1828. Photo by Candace Clifford.*

### *Training Course*

Up-to-date training on a regular basis is an essential element in federal agency preservation program planning. The Advisory Council on Historic Preservation has developed and taught a two-day training course especially tailored for U.S. Coast Guard personnel. The course emphasizes situations and property types typically encountered by the U.S. Coast Guard.

### *Condition Assessments*

A survey team of historical architects and a maritime historian have visited 21 former light stations in nine states, encompassing five different construction types. For each site, the team assessed physical condition and historical significance, and prepared a report which describes the historic features, identifies and prioritizes preservation treatments to be implemented as funds became available, and provides a historical overview and significance evaluation for the former station.

### *Handbook*

When completed, the *Historic Lighthouse Preservation Handbook* will be made available to every lighthouse manager in the country. It will focus on the maintenance problems associated with the many different materials and construction techniques used in former light stations. In addition, the *Handbook* will recommend strategies for the evaluation and documentation of former light stations, as well as include a history of lighthouse construction types; existing historic preservation laws, standards, and guidelines; and sources for more information relating to lighthouses. A section on conservation of classical lenses is also planned.

### *The Partners*

The U.S. Coast Guard Historic Resources Preservation Planning Project is coordinated by the NPS National Maritime Initiative. Other partners include the Advisory Council on Historic Preservation; the Navy's Legacy Cultural Resource Management Program; the NPS's Division of Conservation, Interagency Resources Division, Preservation Assistance Division, and Williamsport Preservation Training Center; and the non-profit U.S. Lighthouse Society.